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Thermal Hall effect and Berry curvature of spin waves in magnets
SHUICHI MURAKAMI, Department of Physics and TIES, Tokyo Institute of Technology, RYO MATSUMOTO, RYUICHI SHINDOU, Department of Physics, Tokyo Institute of Technology — Spin waves (magnons) form band structure similar to electrons, and therefore their geometrical structure in k space can be characterized by Berry curvature. This Berry curvature of spin waves causes various interesting phenomena such as thermal Hall effect [1,2] and topological magnonic crystals [3]. In my presentation, we derive the thermal Hall conductivity for spin waves in generic magnets represented as a bosonic Bogoliubov-de Gennes Hamiltonian. We apply this theory to magnetostatic modes in YIG and evaluate the thermal Hall conductivity for the forward volume-wave mode in YIG. We also discuss the relationship with other previous theories on Hall effect of magnons and other bosons. We also apply our theory to magnets with topological chiral edge modes, and discuss thermal transport for the topological edge modes.

[1] R. Matsumoto, S. Murakami, Phys. Rev. B 84, 184406 (2011).
[2] R. Matsumoto, S. Murakami, Phys. Rev. Lett. 106, 197202 (2011).
[3] R. Shindou et al., arXiv.: 1204.3349.

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